

**THE EFFECT OF HOT APPLICATION VERSUS
CONTRAST THERAPY ON KNEE RELATED
SYMPTOMS AMONG PATIENTS WITH KNEE
OSTEOARTHRITIS IN SELECTED COMMUNITY
AREA AT PERAMBALUR**



Dissertation submitted to

**THE TAMILNADU DR. M.G.R MEDICAL UNIVERSITY
CHENNAI**

**IN PARTIAL FULFILLMENT OF REQUIREMENT
FOR THE AWARD OF DEGREE OF**

MASTER OF SCIENCE IN NURSING

APRIL 2016

**THE EFFECT OF HOT APPLICATION VERSUS
CONTRAST THERAPY ON KNEE RELATED
SYMPTOMS AMONG PATIENTS WITH KNEE
OSTEOARTHRITIS IN SELECTED COMMUNITY
AREA AT PERAMBALUR**

Certified that this is the bonafide work of

**Reg. No: 301411704,
MEDICAL SURGICAL NURSING,
THANTHAI ROEVER COLLEGE OF NURSING,
PERAMBALUR**

COLLEGE SEAL :

SIGNATURE :

Prof. R.PUNITHAVATHI, M.Sc (N).,
Principal,
Thanthai Roever College of Nursing,
Perambalur, Tamil Nadu.

Dissertation submitted to

**THE TAMILNADU DR. M.G.R MEDICAL UNIVERSITY
CHENNAI**

IN PARTIAL FULFILLMENT OF REQUIREMENT
FOR THE AWARD OF DEGREE OF
MASTER OF SCIENCE IN NURSING

APRIL 2016

Approved by the Dissertation Committee On : _____

**THE EFFECT OF HOT APPLICATION VERSUS
CONTRAST THERAPY ON KNEE RELATED
SYMPTOMS AMONG PATIENTS WITH KNEE
OSTEOARTHRITIS IN SELECTED COMMUNITY
AREA AT PERAMBALUR**

Research Guide

: _____
Prof. R. PUNITHAVATHI M.Sc (N).,
Principal,
Thanthai Roever College of Nursing,
Perambalur, Tamil Nadu.

Clinical Speciality Guide

: _____
Prof. V.J. ELIZABETH M.Sc. (N).,
Vice-principal,
Thanthai Roever College of Nursing,
Perambalur, Tamil Nadu.

Dissertation submitted to

**THE TAMILNADU DR. M.G.R MEDICAL UNIVERSITY
CHENNAI**

IN PARTIAL FULFILLMENT OF REQUIREMENT
FOR THE AWARD OF DEGREE OF

MASTER OF SCIENCE IN NURSING

APRIL 2016

INTERNAL EXAMINER

EXTERNAL EXAMINER

DECLARATION

I, **301411704** hereby declare that this dissertation entitled **A STUDY TO COMPARE THE EFFECTIVENESS OF HOT APPLICATION VERSUS CONTRAST THERAPY ON KNEE RELATED SYMPTOMS AMONG PATIENTS WITH KNEE OSTEOARTHRITIS IN SELECTED COMMUNITY AREA AT PERAMBALUR** has been prepared by me under the guidance and direct supervision of **Prof. R.PUNITHAVATHI, M.Sc(N)**, Principal, Thanthai Roever College of Nursing, Perambalur, as requirement for partial fulfilment of **M.Sc Nursing** degree course under **The Tamilnadu Dr. M.G.R. Medical University, Chennai** . This dissertation had not been previously formed and this will not be used in future for award of any other degree or diploma. This dissertation represents independent original work on the part of the candidate.

Place : Perambalur,

Date : April – 2016.

301411704,

II Year M.Sc (N) Student,

Thanthai Roever College of

Nursing, Perambalur.

ACKNOWLEDGEMENT

I hereby offer my heartfelt gratitude to the King of kings and the Lord of lords , the Almighty God who makes all things beautiful in His own time. His grace and blessing was my strength throughout this study.

I express my sincere gratitude to **Dr. K. Varadharaajen, BA.,BL., Chairman and Managing Trustee, Thanthai Roever College of Nursing, Perambalur** for providing me an opportunity to pursue this Post Graduate programme in this esteemed institution.

I would like to express my gratitude to **Prof .R. Punithavathi, M.Sc. (N)., Principal Thanthai Roever College of Nursing** for her valuable suggestions, encouragement and keen interest in the planning and execution of the study.

I would like to express my gratitude to my guide **Prof. V.J. Elizabeth., M.Sc. (N)., Vice Principal Thanthai Roever College of Nursing** who gave me valuable suggestions, guidance and encouragement which shaped and fashioned my study.

I thank all **teaching faculty of Thanthai Roever College of Nursing** for their timely advice, encouragement and support. I am grateful to all the **experts** for their sincere efforts in validating my tool.

I express my words of appreciation to **Mr. Venktraman M.Sc., M.Phil.,**Statistician, for his guidance and suggestions in the statistical analysis of the data.

My heartfelt gratitude to the village President **Mrs.Baby** and **Mr.Devaraj** for giving permission to conduct the study.

My gratitude to **Mrs.V.Backiyalakshmi M.Phil., librarian of Thanthai Roever College of Nursing and** all the library staffs of **Tamil nadu Dr. M.G.R. Medical University, Chennai** for their support and guidance in procuring the literature related to the study.

It is my immense pleasure to express my heartiest gratitude to my family members, **Mr. C.R.Gopalakrishnan** my dear father for his moral support and priceless encouragement from birth till now, **Mrs. G.Lakshmi** my dear mother for her kind unconditional help, love and encouragement. I am extremely thankful to my brother **Mr. G.Rajamanikandan**, for his support and motivation throughout my career.

I extend my hearty thanks to my beloved husband **Mr.S. Sukumar** for supporting me and helped me in accomplishing this study. I thank my lovable baby **Master. S.Sujith Priyan** for Cooperating me to accomplish this study. I thank my lovable friend **Ms.V. Krishna Priya** for helping me during the study.

My heartfelt thanks to all my **friends** for their constant support, co-operation and mutual aid during the study.

As a final note I, the investigator, owe a deep sense of gratitude to all those who have directly or indirectly contributed to the successful completion of this endeavour.

TABLE OF CONTENTS

CHAPTER NO	TITLE	PAGE NO
I	INTRODUCTION	1-6
	Need for the study	2
	Statement of the problem	3
	Objectives of the study	3
	Research hypotheses	4
	Operational definitions	5
	Assumptions	6
	Delimitations	6
	Projected outcome	6
II	REVIEW OF LITERATURE	7-16
	Related Studies	7-12
	Conceptual Framework	13-16
III	METHODOLOGY	17-22
	Research approach	17
	Research design	17
	Variables	17
	Setting of the study	18
	Population	18
	Sample size and sampling technique	18
	Pilot study	20
	Data collection procedure	20
	Plan for data analysis	20
	Schematic representation of research methodology	22

CHAPTER NO	TITLE	PAGE NO
IV	DATA ANALYSIS AND INTERPRETATION	23-39
V	DISCUSSION	40-43
VI	SUMMARY,IMPLICATIONS AND CONCLUSION	44-48
	Major findings of the study	45
	Implications	47
	Recommendations and conclusion	48
	REFERENCES	49-54
	ANNEXURES	i-xv

LIST OF TABLES

TABLE NO	TITLE	PAGE NO
1	Frequency and percentage distribution of demographic variables of patients with osteoarthritis in the experimental group I and group II.	24
2	Frequency and percentage distribution of pre-test and post-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group I	29
3	Frequency and percentage distribution of pre-test and post-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group II	31
4	Comparison of pre-test and post-test mean score of knee related symptoms among patients with knee osteoarthritis in the experimental group I	33
5	Comparison of pre-test and post-test mean score of knee related symptoms among patients with knee osteoarthritis in the experimental group II	34
6	Comparison of post-test mean score of knee related symptoms among patients with knee osteoarthritis between the experimental group I and group II	35
7	Association of pre-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group I with their selected demographic variables.	36
8	Association of pre-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group II with their selected demographic variables.	38

LIST OF FIGURES

FIGURE NO	TITLE	PAGE NO
1	Conceptual framework	16
2	Schematic representation of research methodology	22
3	Percentage distribution of age of patients with knee osteoarthritis	26
4	Percentage distribution of sex of patients with knee osteoarthritis	26
5	Percentage distribution of type of physical activity of patients with knee osteoarthritis	27
6	Percentage distribution of BMI of patients with knee osteoarthritis	27
7	Percentage distribution of duration of knee related symptoms of patients with knee osteoarthritis	28
8	Percentage distribution of pre-test and post-test level of knee related symptoms among patients with knee osteoarthritis receiving hot application in experimental group-I.	30
9	Percentage distribution of pre-test and post-test level of knee related symptoms among patients with knee osteoarthritis receiving contrast therapy in experimental group II	32

LIST OF ANNEXURES

ANNEXURE NO	TITLE	PAGE NO
I	Letter seeking permission for Research Purpose	i
II	Letter seeking experts opinion for content validation	ii
III	Evaluation criteria checklist for validation.	iii
IV	List of experts opinion for content validity of research tool	iv
V(A)	Certificate of English editing	v
V(B)	Certificate of Tamil editing	vi
VI	Informed consent	vii
VII(A)	Data collection tool (English)	viii-xi
VII(B)	Data collection tool(Tamil)	xii-xv

**THE STUDY TO COMPARE THE EFFECTIVENESS OF HOT
APPLICATION VERSUS CONTRAST THERAPY ON KNEE
RELATED SYMPTOMS AMONG PATIENTS WITH KNEE
OSTEOARTHRITIS IN SELECTED AREA AT PERAMBALUR**

ABSTRACT

INTRODUCTION: Osteoarthritis is the most common joint disease in the near future and is projected to rank second for women and fourth for men in terms of years lived with disability. WHO reports that osteoarthritis affects 9.6% of men and 18% of women worldwide.

OBJECTIVES: To compare the effectiveness of hot application versus contrast therapy on reduction of knee related symptoms among patients with knee osteoarthritis.

METHODS: True experimental pre-test post-test control group design was adopted for this Study. The study was conducted in Aranarai and Elambalur area at Perambalur. 60 participants were selected by simple random sampling technique and 30 were recruited to each group. The tool used for data collection was Knee injury and osteoarthritis outcome score scale to assess the knee related symptoms. Hot application to experimental group-I and contrast therapy to experimental group-II for twice a day for ten days was given to both groups.

RESULTS: The post-test mean score of experimental group I 18.23 ± 4.46 was higher than that of experimental group II 15.30 ± 3.58 and the calculated 't' value 2.808 was significant at $p < 0.001$ level.

DISCUSSION: The study proved that contrast therapy was effective than the hot application on reduction of knee related symptoms among patients with knee osteoarthritis.

CHAPTER-I

INTRODUCTION

Osteoarthritis is affecting millions of people worldwide. Worldwide, osteoarthritis [OA] is estimated to be the fourth leading cause of disability and one of the most common chronic health conditions impacting many health outcomes. Osteoarthritis is strongly associated with aging and the Asian region is aging rapidly, so does the prevalence of osteoarthritis and the need for cost effective treatment and care.

Most of this disability burden is attributable to the involvement of the hips or knees. Knee pain is an important contributor to the functional limitations, impaired quality of life and psychological distress that osteoarthritis patients experience. The burden of osteoarthritis is physical, psychological, and socioeconomic. It can be associated with significant disability such as a reduction in mobility and activities of daily living. Psychological sequelae includes distress, devalued self worth and loneliness. Given the high frequency of osteoarthritis in the population, its economic burden is large.

Global estimates reveal more than 100 million people are affected by osteoarthritis worldwide. India is expected to be the chronic disease capital with 60 million people with arthritis, by 2025. As per a recent report published in the TIMES OF INDIA [2010] regarding osteoarthritis over 40% of the Indian population in the age group of 70 years of above suffer from osteoarthritis.

Currently available analgesics used chronically for the symptomatic treatment of osteoarthritis have limited effectiveness and side effects are prevalent. Heat, cold, pressure and even electricity have been used for thousands of years to accelerate healing and decrease pain. Heat may work by improving circulation and relaxing muscles so decreasing pain, while cold may numb the pain, decrease swelling, constrict blood vessels and block nerve impulses to the joints. The periodic application of superficial heat or cold is relatively safe and low cost treatment. Contrast therapy involving intervals of warm and cold application within a treatment session offers greater benefit on controlling knee osteoarthritis associated problems.

NEED FOR THE STUDY

A current study claims that osteoarthritis is so common that it beats many other diseases in India, such as diabetes. The lifetime risk of developing knee osteoarthritis has been estimated at 46% .The prevalence and incidence of osteoarthritis considerably increases with age.

Currently the annually estimated cost per year to treat osteoarthritis ranges from \$15.5 to \$26.6 billion and the total cost is actually believed to exceed \$ 89.1 billion in the near future. Not only is osteoarthritis costly to the affected individuals but also it comes with a host of negative effects towards an individual's quality of life and limited mobility related issues associated with severe pain.

Treatment of osteoarthritis revolves around some combination of pharmacological and non-pharmacological treatment modalities. Pharmacotherapy with Non steroidal anti inflammatory drugs, cyclooxygenase II (cox II) inhibitors are prone to develop severe side effects .Topically applied NSAID's are also useful to a certain extent, so there is a need to evaluate and implement alternative modalities to manage the

discomfort of the patient. In case of advance osteoarthritis, only a total joint replacement can provide relief. However, many patients are not candidates for joint replacement, as the surgery is highly invasive and secondary procedure is extremely expensive.

With statistics showing that more of the population will be affected by knee osteoarthritis, There is an inbuilt need to consider what are the most relevant, cost effective and appropriate care strategies to be implemented at tackling disability due to osteoarthritis.

During the experience, investigator witnessed that more number of elderly people expressed knee related symptoms and its serious impact on their quality of life and well being. The researcher identified the expressed need as an significant problem and based on the prevalence of osteoarthritis and feasibility of hot water application and contrast therapy the investigator was motivated to conduct a comparative study to assess the effectiveness of hot application and contrast therapy on reduction of knee related symptoms.

STATEMENT OF THE PROBLEM

A study to compare the effectiveness of hot application versus contrast therapy on knee related symptoms among patients with knee osteoarthritis in selected community area at Perambalur.

OBJECTIVES

1. To assess the level of knee related symptoms among patients with knee osteoarthritis.
2. To assess the effectiveness of hot application on reduction of knee related symptoms among patients with knee osteoarthritis

3. To assess the effectiveness of contrast therapy on reduction of knee related symptoms among patients with knee osteoarthritis
4. To compare the effectiveness of hot application versus contrast therapy on reduction of knee related symptoms among patients with knee osteoarthritis.
5. To associate the pre-test level of knee related symptoms among patients who receive hot application with their selected demographic variables.
6. To associate the pre-test level of knee related symptoms among patients who receive contrast therapy with their selected demographic variables.

RESEARCH HYPOTHESES

H1: There will be a significant difference in knee related symptoms among patients with knee osteoarthritis who receive hot application.

H2: There will be a significant difference in knee related symptoms among patients with knee osteoarthritis who receive contrast therapy.

H3: There will be a significant difference between hot application and contrast therapy on reduction of knee related symptoms among patients with knee osteoarthritis.

H4: There will be a significant association between pre-test level of knee related symptoms and selected demographic variables of patients with knee osteoarthritis who receive hot application.

H5: There will be a significant association between pre-test level of knee related symptoms and selected demographic variables of patients with knee osteoarthritis who receive contrast therapy.

OPERATIONAL DEFINITIONS

EFFECTIVENESS

It refers to the changes in the knee related symptoms brought out by the hot application and contrast therapy and it is measured by knee injury and osteoarthritis outcome score scale.

HOT APPLICATION

It refers to the application of heat over the knee joint surface with hot water bag at temperature of 140 degree Fahrenheit for 10 minutes for 2 times a day for 10 days.

CONTRAST THERAPY

It refers to the application of alternative heat and cold application over the knee joint surface in the form of hot water bag application in the morning and ice pack in the evening for 10 minutes a day for 10 days.

OSTEOARTHRITIS

It refers to an inflammatory joint disorder marked by degeneration of the articular cartilage, hypertrophy of bone at the margins and changes in the synovial membrane accompanied by pain and stiffness in the knee joint.

KNEE RELATED SYMPTOMS

Symptoms perceived and expressed by the patient in terms of pain, swelling, stiffness, congestion as a result of deterioration of the involved knee joint which will be measured by knee injury and osteoarthritis outcome scale.

ASSUMPTIONS

1. Knee related symptoms cripples the patient
2. Hot application relieves pain, inflammation and congestion
3. Contrast therapy relieves pain, swelling and stiffness
- 4 .Contrast therapy is more effective than hot application

DELIMITATIONS

1. This study is limited for 60 samples only
2. This study is limited for 4 weeks duration only
3. This study is limited to two rural setting only

PROJECTED OUTCOME

The findings of the study will reveal the effectiveness of using hot application/contrast therapy on reduction of knee related symptoms in patients with knee osteoarthritis. If found to be effective this intervention could be incorporated as one of the nursing measures to reduce knee related symptoms among patients with knee osteoarthritis.

CHAPTER-II

REVIEW OF LITERATURE

The review of literature refers to an extensive, exhaustive and systematic examination of publications relevant to the research project. Thorough literature review provides a foundation on which to base new knowledge and familiarization with previous studies.

PART-I

The review of related literature is organized under the following section.

- Section A : studies related to osteoarthritis
- Section B : studies related to hot application for osteoarthritis
- Section C : studies related to cold application for osteoarthritis
- Section D : studies related to hot application versus contrast therapy for osteoarthritis

Section A-studies related to osteoarthritis

Zeng.c, et al. [2016] examined the association between dietary antioxidants (carotenoid, vitamin C, vitamin E and selenium) intake and knee osteoarthritis among 4685 subjects .Dietary intake was assessed using a semi-quantitative food frequency questionnaire. A multivariable logistic analysis model was used to test the relationship between dietary antioxidants intake and knee osteoarthritis. The results suggested that among dietary antioxidants only vitamin c intake was positively correlated with the prevalence of knee osteoarthritis.

Veronese.N,et al. [2015] investigated the association between osteoarthritis and the onset of cardiovascular disease among 3099 elderly subjects for 4.4_±1.2 years. At the baseline, 1336 subjects suffered from osteoarthritis .During the follow-up 47.8% of the subjects with osteoarthritis at baseline developed a new cardiovascular disease than 41.3% of those without osteoarthritis .The results suggested that the association between osteoarthritis and cardiovascular disease was stronger when more joints were involved.

Plotnikoff.R, et al. [2015] investigated the prevalence of self-reported knee and hip osteoarthritis and examined the association of modifiable factors with knee and hip osteoarthritis prevalence among 4733 subjects in Canada. The results suggested that overall prevalence of self-reported osteoarthritis was 14.8%, where 10.5% of subjects reported having knee osteoarthritis and 8.5% reported having hip osteoarthritis. Modifiable factor, being obese was significantly associated with prevalence of knee and hip osteoarthritis.

M.A.Yuquing zhang, et al. [2015], assessed the risk of cardiovascular events after joint replacement surgery among osteoarthritis patients.13,849 patients aged 50 with knee osteoarthritis who underwent total knee replacement surgery compared with 13,849 subjects who did not received surgery. The researchers found the risk of heart attack was significantly higher for knee arthroplasty patients after surgery.

Chen J.S, et al. [2013] determined the effect of fish oil on bone mineral density [BMD],among 202 participants aged >40 with knee osteoarthritis in Australia. Samples were randomized to receive either high dose[4.5g/day] or low dose[0.45g/day] omega-3 fish oil for 2 years .The results suggested that high-dose omega-3 fish oil did not alter bone loss among men and women with knee osteoarthritis.

Tveit M, et al. [2012] assessed the physical function of older clients with clinical knee osteoarthritis. 106 sedentary subjects more than 60 years with knee osteoarthritis were participated in the study. Mobility, joint flexibility and muscle strength were evaluated by recording time to ascend 8 of descend 4 stairs, rise from sitting or sit down from chair (5 times). Using spearman correlation walking, stairs climbing, chair rise were significantly correlated with each other and with the pain rating scale index ($p < 0.001$).

Guh, et al. [2009] determined whether knee osteoarthritis reduces ambulatory capacity and impairs quality of life. 56 subjects were selected with and without osteoarthritis. 6 minute walk test was performed to assess the ambulatory status. The results showed that subjects without knee osteoarthritis walked a significantly longer distance than subjects with knee osteoarthritis.

Zifchockr, et al. [2008] conducted an exploratory study to understand the experience of living with knee osteoarthritis in older adults. Interviews were conducted with knee osteoarthritis patients of different ages, sexes, cultural background and self perception. The results showed that living with knee osteoarthritis experiencing knee pain is central to daily living and experiencing mobility limitations devalues self-worth.

SECTION-B studies related to hot application

Shunsukeochiai, et al. [2014], determined the effectiveness of thermotherapy using a heat and steam generating sheet among patients with knee osteoarthritis in Japan. 22 females aged 50-69 were randomly assigned to either a local heat treatment [LH] group or an exercise therapy group [ET]. The samples were subjected to a 12 week intervention experiment. For clinical evaluation, the Japanese knee osteoarthritis measure [JKOM] was performed. There is significant decrease in JKOM score in LH group than ET

group. Results showed that thermotherapy was effective when using a steam generating sheet.

Wafaal.shereif, et al. [2011], analysed the uses of therapeutic exercise and heat application on improvement of physical function among patients with knee osteoarthritis. 90 osteoarthritis patients are randomly selected and divided into three groups. Group 1 received training to use heat application with pharmacological treatment, group 2 received training of physical exercise with pharmacological treatment, group 3 received a combination training of physical exercise and heat application with pharmacological treatment. The results showed that the use of a combination of therapeutic exercise and heat application together was effective.

Yildirim, et al. [2010], studied the effect of superficial local heat application on pain, stiffness, physical function and quality of life in patients with knee osteoarthritis. 46 patients with knee osteoarthritis were divided into two groups as intervention and control groups. Statistically significant differences were found between the control and intervention group patients in terms of changes in the scores for physical function, pain, and general health perception [$p < 0.05$]. The results showed that heat application reduce pain and increase the physical function in patients with knee osteoarthritis.

Rabini .A, et al. [2007], compared and determined the effects of deep heating therapy and superficial heat therapy among 44 patients with knee osteoarthritis at outpatient clinic of the department of geriatrics, Gerontology University and hospital. Deep heating therapy with local microwave diathermy and short heating therapy with hot packs application was given for three 30 minutes sessions a week for four weeks. The results showed that deep heating therapy via localized microwave diathermy improves pain, muscle strength, and physical function in patients with knee osteoarthritis.

SECTION-C studies related to cold application

Oosterveld F.G, et al.[2010]evaluated the effects of local application of ice chips, ligno-paraffin, short wave diathermy and nitrogen cold air on the intra articular skin surface of the knee.44 subjects were involved in the four treatment groups. Group 1 subjects received local application of ice for 30 minutes, group 2 subjects received nitrogen cold air for 6 minutes, group 3 subjects received short wave diathermy for 15 minutes, and group 4 received lingo paraffin for 10 minutes. Results showed that cold application was suitable for patients with inflammed knee osteoarthritis. The studies concluded that most studies dealing with the effects of heat and cold on pain, joint stiffness, grip strength and joint function in joints report beneficial effects.

Brosseau.L, et al. [2006], assessed the effectiveness of thermotherapy in patients with knee osteoarthritis. Over 170 people with osteoarthritis continue to take their medications but used hot, cold, or ice packs, with or without massage. The results showed that ice massage compared to control had a statistically beneficial effect on ROM, function and knee strength.

SECTION-D studies related to hot application and contrast therapy

Qianchen [2015], conducted a research on information related to the need to perform heat and cold applications as Non pharmacological method for pain control in knee osteoarthritis patients. The results showed that superficial heat and cold applications were used to help treatment due to the presence of very few side effects and ease of implementation.

AmaleE.Shehata, et al. [2013], compared the effects of warm, cold, and contrast therapy among 34 patients with knee osteoarthritis at orthopaedic outpatient clinic of Menoufiya University and teaching hospital in Egypt. The

tools used to collect data were an interviewing questionnaire, knee injury and osteoarthritis outcome score and numeric pain scale. This study revealed that a distinct individual effect was observed for use of warm, cold and contrast therapy for knee osteoarthritis pain and problems, but the greater knee problem and pain relief were found when subjects used contrast therapy.

Craig R. Denegar, et al. [2010], assessed the preferences for and effects of heat, cold or contrast among 34 patients with knee osteoarthritis. 5 days of twice daily superficial heat, cold or contrast therapy was given for patients. A knee injury and osteoarthritis outcome scale questionnaire and visual analogue scale was completed at baseline and twice each week. Evaluation showed that warm was preferred by 48% of subjects, near equal preferences were observed for cold [24%] and contrast therapy [24%]. The result showed that superficial heat or cold is considered in the management of knee osteoarthritis that contrast is the treatment option.

Naomi Schlesinger .N [2006], determined the response to topical ice versus heat application to differentiate patients with gout and arthritis. 150 patients participated in the study. None of the patients with gout benefitted from topical heating of their affected joints and all preferred topical ice while patients with arthritis preferred topical heat. Results showed that heat and cold are adjuvant treatments and may help discriminate patients with gout and other arthritis.

The above reviewed literature showed the promising effect of contrast therapy on knee related symptoms and the study proposes to evaluate the effect of contrast therapy on reduction of knee related symptoms.

PART-II

CONCEPTUAL FRAMEWORK

The conceptual framework of the study was derived from the modified Wiedenbach's helping art of clinical nursing theory[1964].

According to the theory, the nursing is involved in three components.

- Identifying need for help
- Ministering the need for help
- Validating that need for help was met

In this study, the nurse investigator attaining the goal through 3 steps of wiedenbach's perspective theory.

STEP-I

IDENTIFYING NEED FOR HELP

GENERAL INFORMATION

For collecting general information the investigator collect information through demographic variables such as age, sex, type of physical activity, body mass index, duration of knee osteoarthritis, treatment and pre-test collect information about knee related symptoms as mild, moderate, severe and extreme.

THE CENTRAL PURPOSE

According to the theory the central purpose refers to what the nurse wants to accomplish. It is the overall plan towards nurse strives. In this study the central purpose was the reduction of knee related symptoms.

THE PRESCRIPTION

According to the theory the prescription refers to the plan of care for patients .It specifies the nature of action that will fulfill the nurse's central purpose and the rationale for that action. After the prescription of established plan, the nurse can implement it through the nursing care plan.

STEP-II

MINISTERING THE NEED FOR HELP

The nurse formulates a plan for meeting the patients need for help based on available resources. The nurse presents the plan to the patients and the patient's response to it.

REALITIES

It refers to the physical, physiological, emotional and spiritual factors that come into play in a situation involving nursing action. Wiedenbach's defines the 5 –realities as agent, recipient, goal, mean and framework.

The agent is the nurse who provides nursing care. In this study it refers to the researcher, direct all action toward the goal.

The recipient is the patient who has problems, capabilities and abilities to cope with the concerns or problems being experienced .In this study recipients are patients knee osteoarthritis.

The goal is the nurses desired outcome .In this study it refers to reduction of knee related symptoms.

The mean comprise the activities and devices used by the nurse to achieve the goal .In this study using hot water application and contrast therapy two times per day for ten days according to the knee related symptoms .

The framework consists of the human, environment, professional, and organizational facilities .In this study knee osteoarthritis patients were selected at community areas at Aranarai and Elambalur.

STEP-III

VALIDATING THAT NEED FOR HELP WAS MET

The nurse perceives the patient behaviour consistent or inconsistent with the nurse concept of comfort of capability.

It refers to a collection of evidence that shows patients need have been met and that his/her functional ability has been restored as a direct result of the research action. This step involves post-test assessment and interpreting the scores obtained to infer the outcome.

In this study the post test was done through knee injury and osteoarthritis outcome scale. .

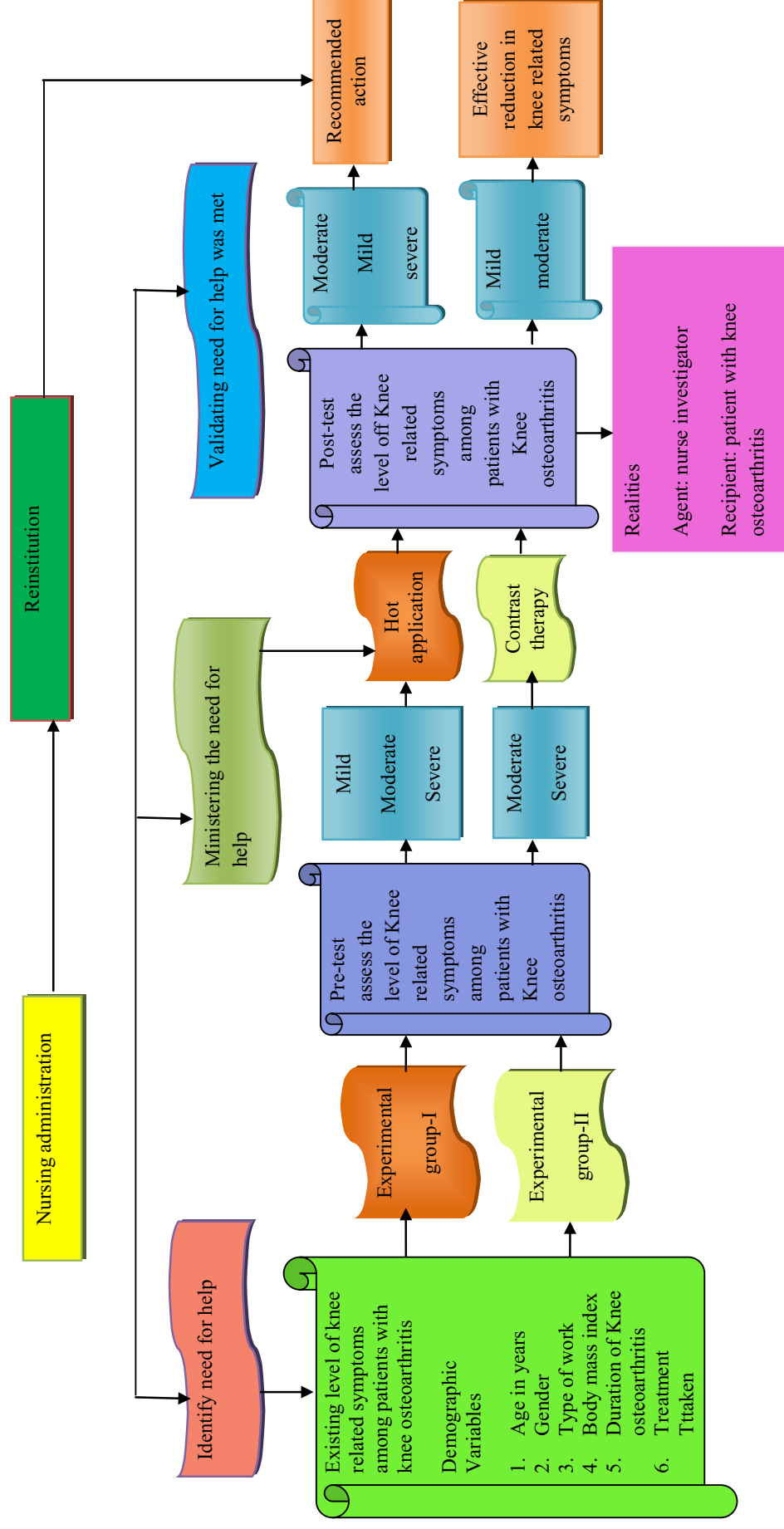


FIGURE 1: WIEDENBACH'S HELPING ART CLINICAL NURSING THEORY (1964)

CHAPTER-III

RESEARCH METHODOLOGY

This chapter describes the methodology followed to compare the effectiveness of hot application versus contrast therapy on reduction of knee related symptoms in patients with knee osteoarthritis.

RESEARCH APPROACH

Evaluative and comparative approach

RESEARCH DESIGN

True experimental pre-test post-test design

GROUPS	PRE TEST	INTERVENTION	POST TEST
Experimental group-I	O1	X1	O2
Experimental group-II	O1	X2	O2

E1 – Experimental group I which was receiving hot application

E2 - Experimental group II which was receiving Contrast therapy

O1-Pretest measurement of knee related symptoms

O2-Posttest measurement of knee related symptoms

X1-Hot application

X2-Contrast therapy

VARIABLES

INDEPENDENT VARIABLE

Hot application/contrast therapy.

DEPENDENT VARIABLE

Knee related symptoms.

SETTING

The study was conducted on selected rural areas at Aranarai and Elambalur.

POPULATION

Patients with osteoarthritis.

TARGET POPULATION

Patients with osteoarthritis having knee related symptoms.

ACCESSIBLE POPULATION

Patients with osteoarthritis having knee related symptoms who are residing in Elambalur and Aranarai area.

SAMPLE

Patients with knee osteoarthritis who met the inclusion criteria.

SAMPLE SIZE

The sample size was 60.30 samples in experimental group I and 30 samples in experimental group II.

SAMPLING TECHNIQUE

Simple random sampling technique.

CRITERIA FOR SAMPLE SELECTION**INCLUSION CRITERIA**

1. Patients with osteoarthritis who have knee related symptoms.
2. Patients who are willing to participate.
3. Both male and female patients with knee osteoarthritis.
4. Patients who reside in Elambalur and Aranarai.

EXCLUSION CRITERIA

1. Patients who were not willing to participate.
2. Patients with rheumatoid arthritis, traumatic injury to knee.

DESCRIPTION OF THE TOOL

SECTION –A Questionnaire to elicit of demographic variables.

Interview guide which consists of questions to collect the demographic data like age, gender, type of physical activity, body mass index, duration of knee osteoarthritis and treatment taken.

SECTION–B Modified Knee injury and osteoarthritis outcome score scale.

Knee injury and osteoarthritis outcome score scale was used to assess the level of knee related symptoms. It consists of 15 statements each with 5 responses. Answer categories are mild, moderate, severe, and extreme in each statement. Total score is 60.

GRADING PROCEDURE

LEVEL OF KNEE RELATED SYMPTOMS	SCORE
MILD	0-15
MODERATE	16-30
SEVERE	31-45
EXTREME	46-60

CONTENT VALIDITY

For the content validity the research tool was submitted to experts and requested to give their opinion about the content areas and the relevance denting and appropriateness of their items.

PILOT STUDY

In order to test the feasibility, relevance, and practicability of the study, pilot study was conducted from 6.7.2015 to 12.7.2015 among six samples with permission of the village officer .Three samples were taken in experimental group-I and three in experimental group-II and intervention and data collection done in the same manner as that of the original study. The samples included in the pilot study were excluded in main study. As the pilot study was feasible it was decided to proceed the main study without any modification.

DATA COLLECTION PROCEDURE

Data collection was done from 1.7.2016 to 30.7.2016 in Aranarai and Elambalur village at Perambalur. The objectives of the study were explained to the village administrative officer and permission obtained. The samples were selected at residents of Elambalur and Aranarai village by using simple random sampling technique. The purpose of the study was explained and written consent was obtained from all the patients before the study.

On the day 1 the demographic variables were collected and pre-test was done. The study intervention hot application to experimental group I and contrast therapy was given to the experimental group II for twice a day for 10 days. On the end of the 10th day post-test assessment of knee related symptoms in both groups was done by using knee injury and osteoarthritis outcome score scale.

PLAN FOR DATA ANALYSIS

It was planned to use descriptive and inferential statistics.

DESCRIPTIVE STATISTICS

The frequency and percentage will be used to analyse the demographic variables and level of knee related symptoms.

Mean and standard deviation will be used to assess the pre-test and post test scores.

INFERENTIAL STATISTICS

Paired 't' test

To compare the scores of pre-test and post-test of patients in the same groups.

Independent 't' test

To compare the scores of post-test effectiveness of experimental group I and experimental group II.

Chi-square test

The test will be used to find out the association of pre-test level of knee related symptoms with their selected demographic variables.

ETHICAL CONSIDERATIONS

The Study was conducted after the approval of ethical committee of the Thanthai Roever College of Nursing. Permission was sought from the village president of Aranarai and Elambalur Village at Perambalur. Informed consent obtained from each participants and confidentiality maintained. Study purpose and intervention were explained to each participants.

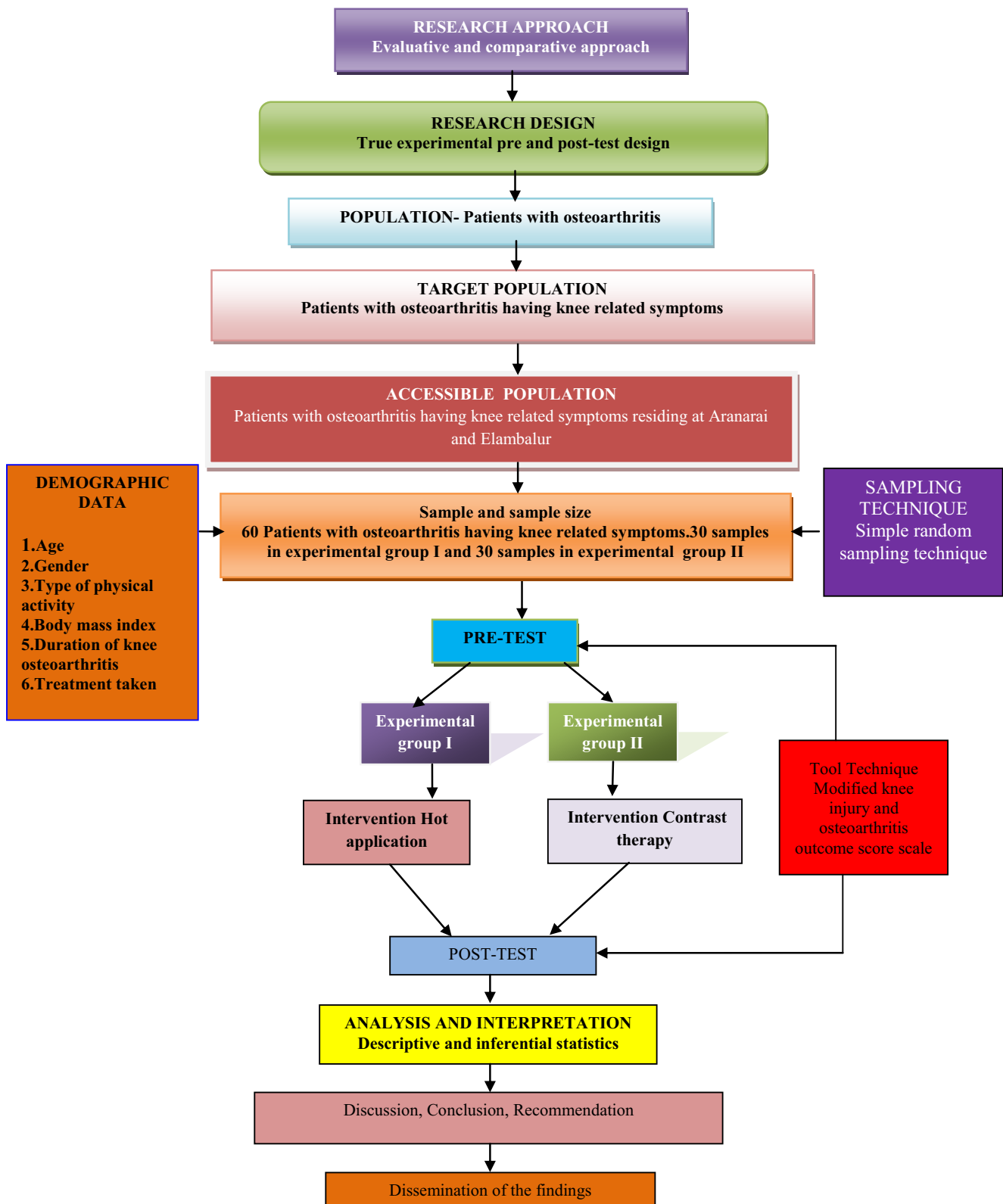


Fig. 2 SCHEMATIC REPRESENTATION OF RESEARCH METHODOLOGY

CHAPTER – IV

DATA ANALYSIS AND INTERPRETATION

This chapter deals with the analysis and interpretation of data collected from 60 patients with knee osteoarthritis pain, to assess the effectiveness of hot application versus contrast therapy on knee related symptoms among patients with knee osteoarthritis. The data collected were grouped and analysed as per the objectives set for the study. The findings based on the descriptive and inferential statistical analysis are presented under the following sections.

ORGANIZATION OF DATA

The findings of the study were grouped and analysed under the following sessions.

Section- A: Description of the demographic variables of patients with knee osteoarthritis.

Section -B: Pre-test and post-test level of knee related symptoms among patients with knee osteoarthritis.

Section C: Effectiveness of Hot Application versus Contrast Therapy on knee related symptoms among patients with knee osteoarthritis in the experimental group –I and experimental group-II.

Section D: Association of pre-test level of knee related symptoms with their selected demographic variables in the experimental group –I and experimental group-II

SECTION - A

Table 1: Frequency and percentage distribution of demographic variables of the patients with knee osteoarthritis in experimental group-I and experimental group-II

N = 60

Demographic Variables	Experimental group-I		Experimental group-II	
	No.	%	No.	%
Age in years				
41-50	0	0.00	0	0.00
51-60	10	33.33	10	33.33
61-70	10	33.33	10	33.33
71-80	10	33.33	10	33.33
Gender				
Male	12	40.00	14	46.67
Female	18	60.00	16	53.33
Type of physical activity				
Sedentary work	12	40.00	12	40.00
Moderate work	18	60.00	18	60.00
Heavy work	0	0.00	0	0.00
Body Mass Index				
Underweight	6	20.00	5	16.67
Normal weight	12	40.00	13	43.33
Overweight	6	20.00	11	36.67
Obese	6	20.00	1	3.33

Demographic Variables	Experimental group-I		Experimental group-II	
	No.	%	No.	%
Duration of knee osteoarthritis in years				
<1	4	13.33	9	30.00
1 - 3	11	36.67	11	36.67
4 - 5	11	36.67	9	30.00
>5	4	13.33	1	3.33
Treatment for osteoarthritis				
Drugs	16	53.33	14	46.67
Physiotherapy	0	0.00	0	0.00
Both	0	0.00	3	10.00
No treatment	14	46.67	13	43.33

The table shows that in the experimental group-I, (33.33%) there was equal representation of samples in all the age groups. Majority 18(60%) were female, 18(60%) were moderate worker, 12(40%) were normal weight, 11(36.67%) had 1 – 3 years and 4 – 5 years duration of knee OA and 16(53.33%) were treated with drug therapy for osteoarthritis.

Whereas in the experimental group-II (33.33%) there was equal representation of samples in all the age groups. Majority 16(53.33%) were female, 18(60%) were moderate worker, 13(43.33%) were normal weight, 11(36.67%) had 1 – 3 years duration of knee OA and 14(46.67%) were treated with drug therapy.

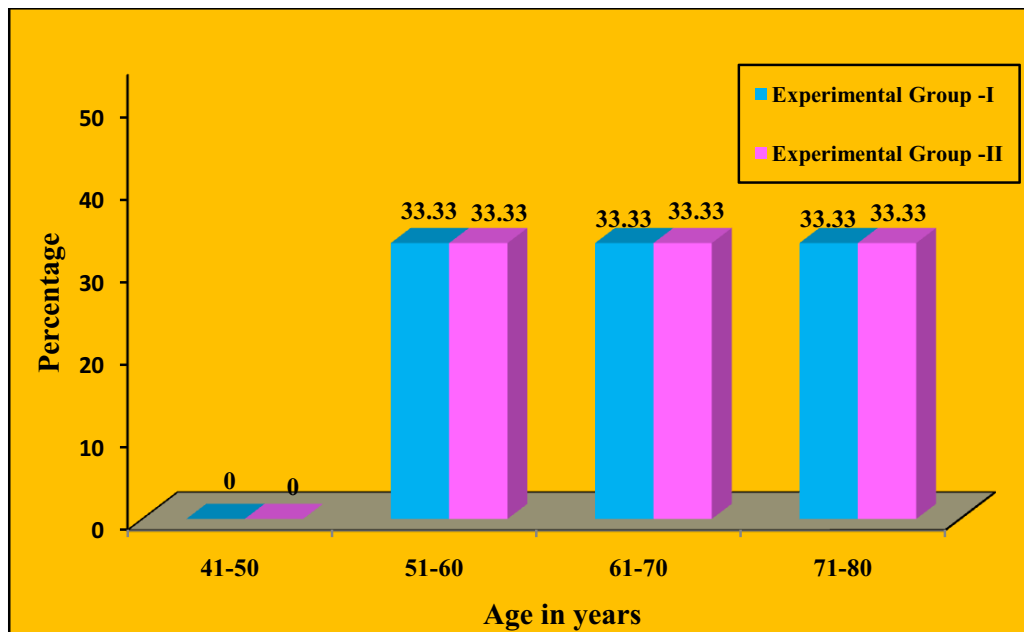


Fig 3: Percentage distribution of age of patients with knee osteoarthritis

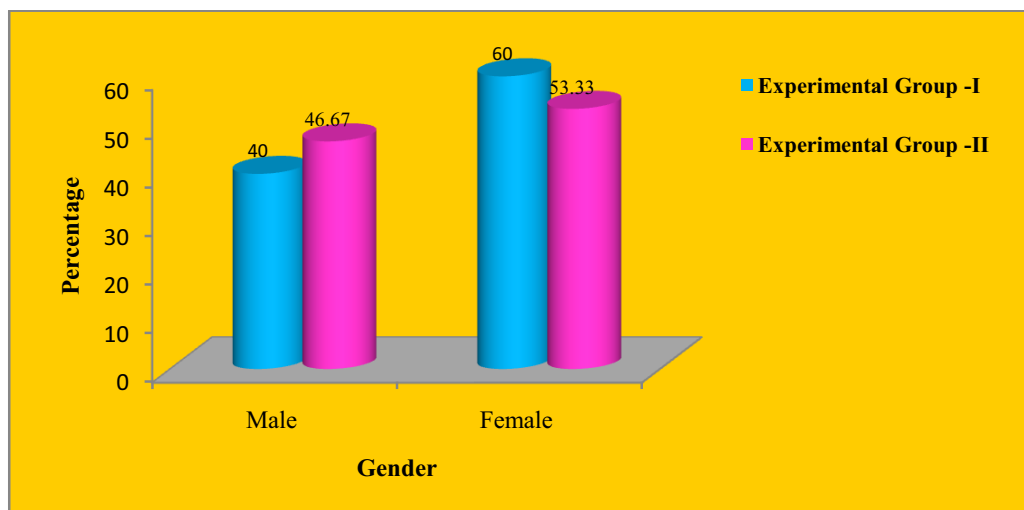


Fig 4: Percentage distribution of sex of patients with knee osteoarthritis

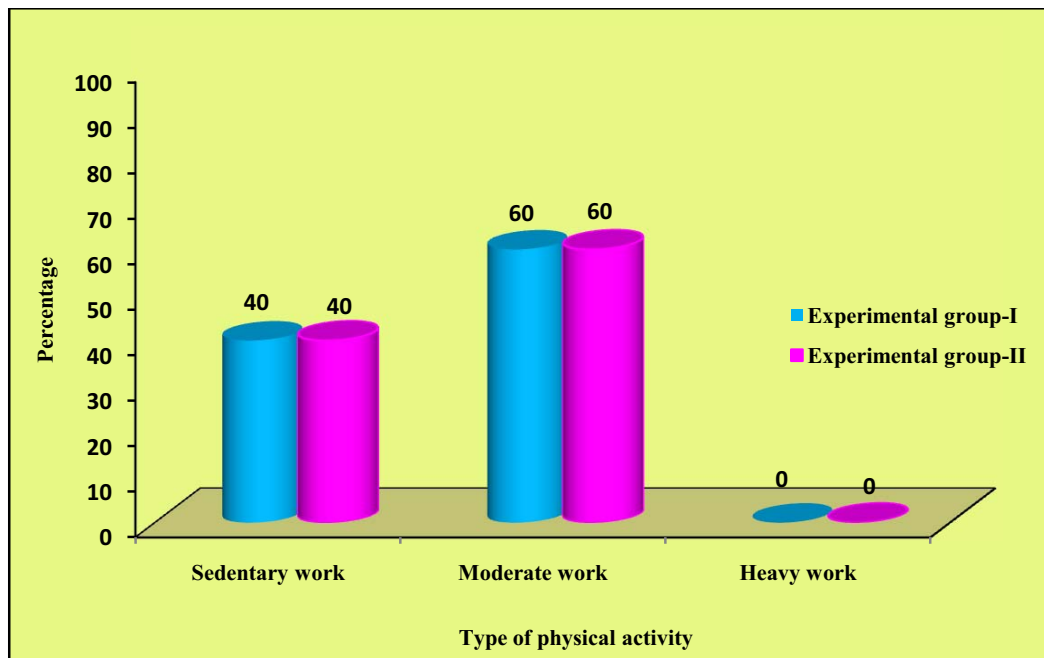


Fig 5: Percentage distribution of type of physical activity of patients with knee osteoarthritis

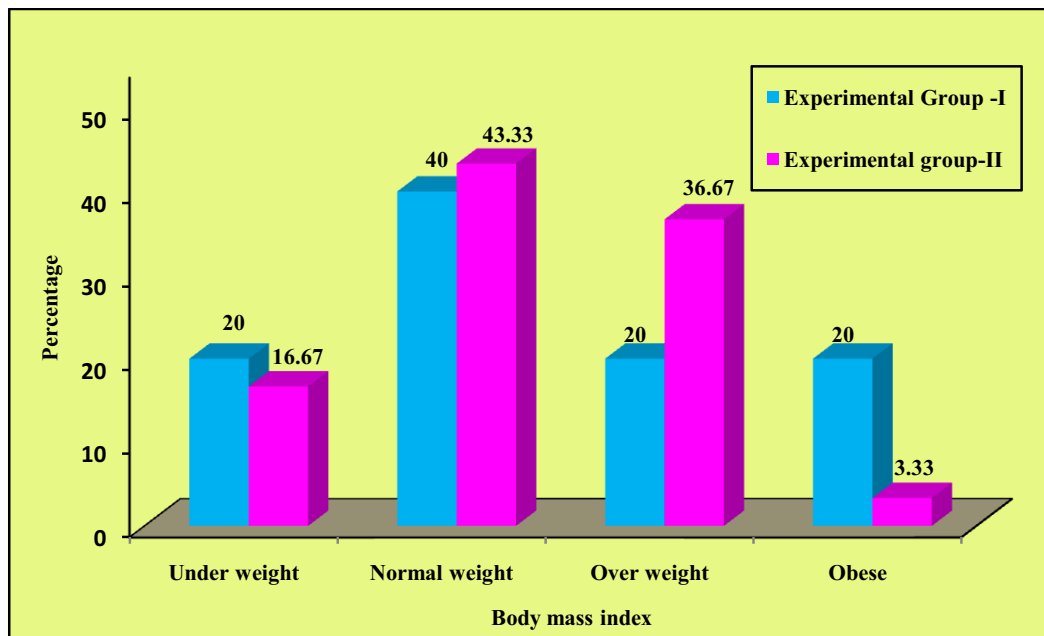


Fig 6: Percentage distribution of BMI of patients with knee osteoarthritis

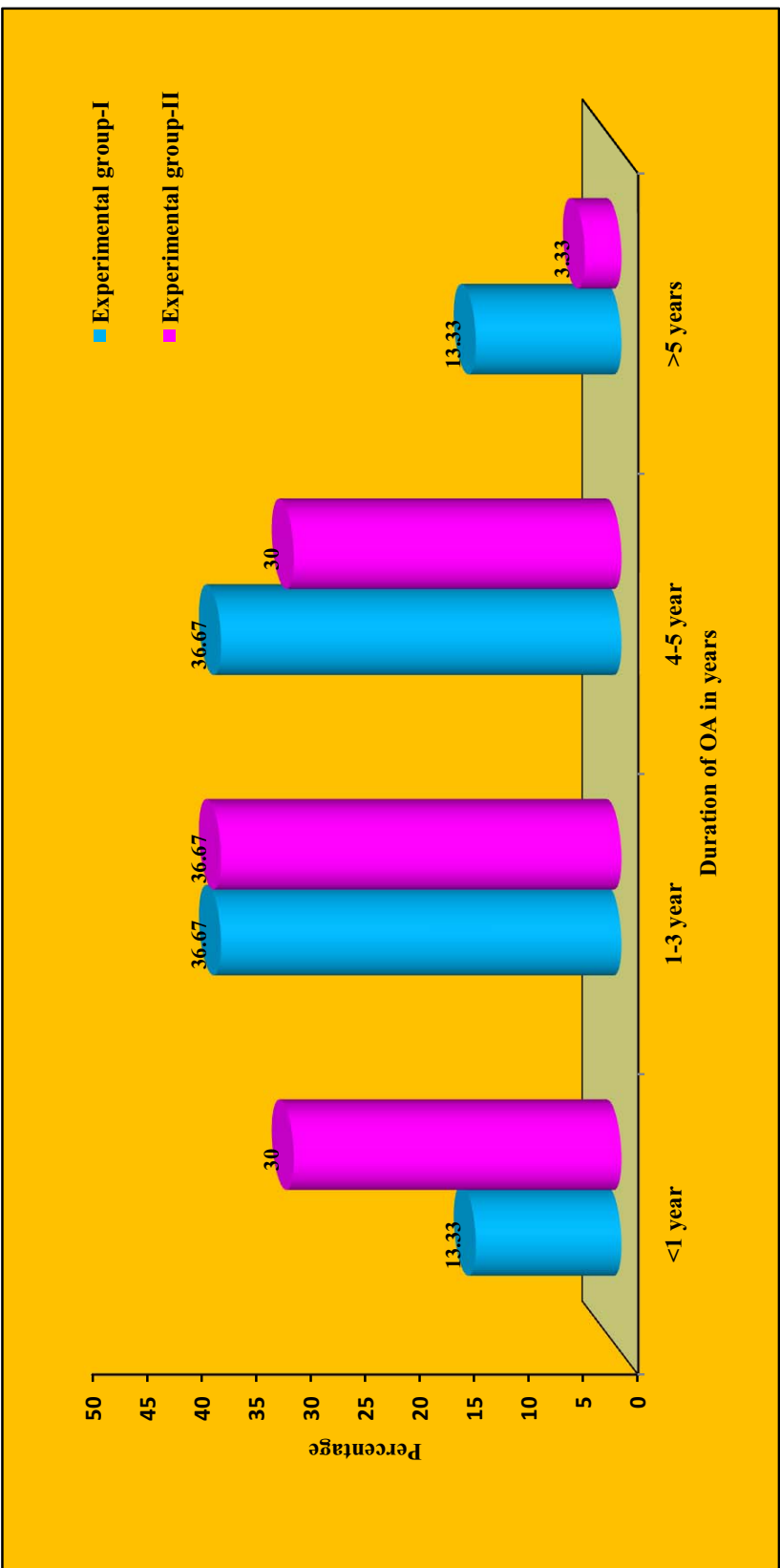


Fig 7 : Percentage distribution of duration of knee osteoarthritis among patients with knee osteoarthritis

SECTION B

Table 2: Frequency and percentage distribution of pre-test and post-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group-I

n = 30

Knee related symptoms	None (0)		Mild (1 – 15)		Moderate (16 – 30)		Severe (31 – 45)		Extreme (46 – 60)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Pre-test	0	0	0	0	27	90.0	3	10.0	0	0
Post-Test	0	0	7	23.33	21	70.0	2	6.67	0	0

The table shows that in the experimental group-I, majority of 27(90%) had moderate level of knee related symptoms and 3(10%) had severe level of knee related symptoms in the pre-test.

Whereas in the post-test, majority 21(70%) had moderate level of knee related symptoms 7(23.33%) had mild level of knee related symptoms and only 2(6.67%) had severe level of knee related symptoms among patients with knee osteoarthritis in the experimental group-I.

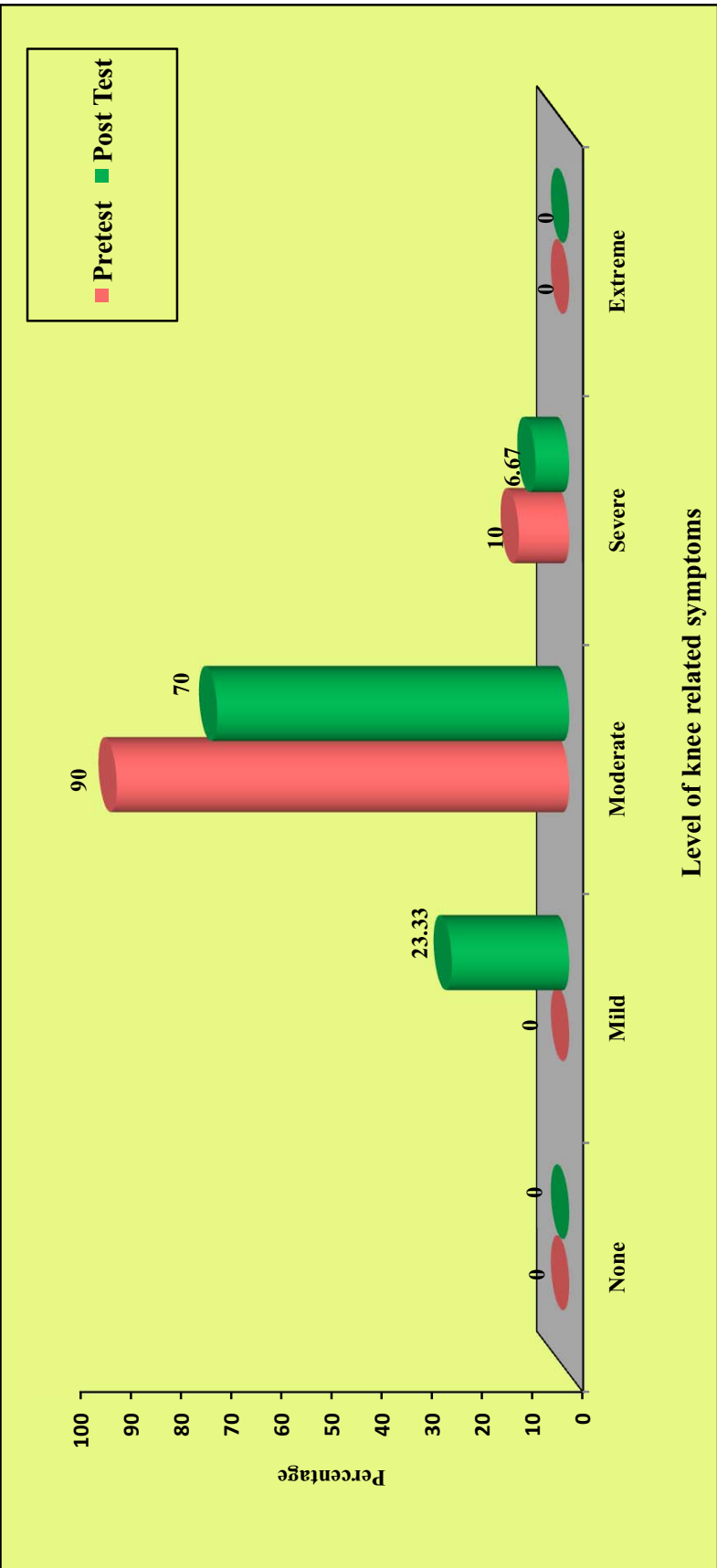


Figure 8 : Percentage distribution of pre-test and post-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group I

Table 3: Frequency and percentage distribution of pre-test and post-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group-II

n = 30

Knee related symptoms	None (0)		Mild (1 – 15)		Moderate (16 – 30)		Severe (31 – 45)		Extreme (46 – 60)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Pre-test	0	0	0	0	26	86.67	4	13.33	0	0
Post-Test	0	0	21	70.0	9	30.0	0	0	0	0

The table shows that in the experimental group-II, majority of 26(86.67%) had moderate level of knee related symptoms and 4(13.33%) had severe level of knee related symptoms in the pre-test.

Whereas in the post-test, majority 21(70%) had mild level of knee related symptoms and 9(30%) had moderate level of knee related symptoms among patients with knee osteoarthritis in the experimental group-II.

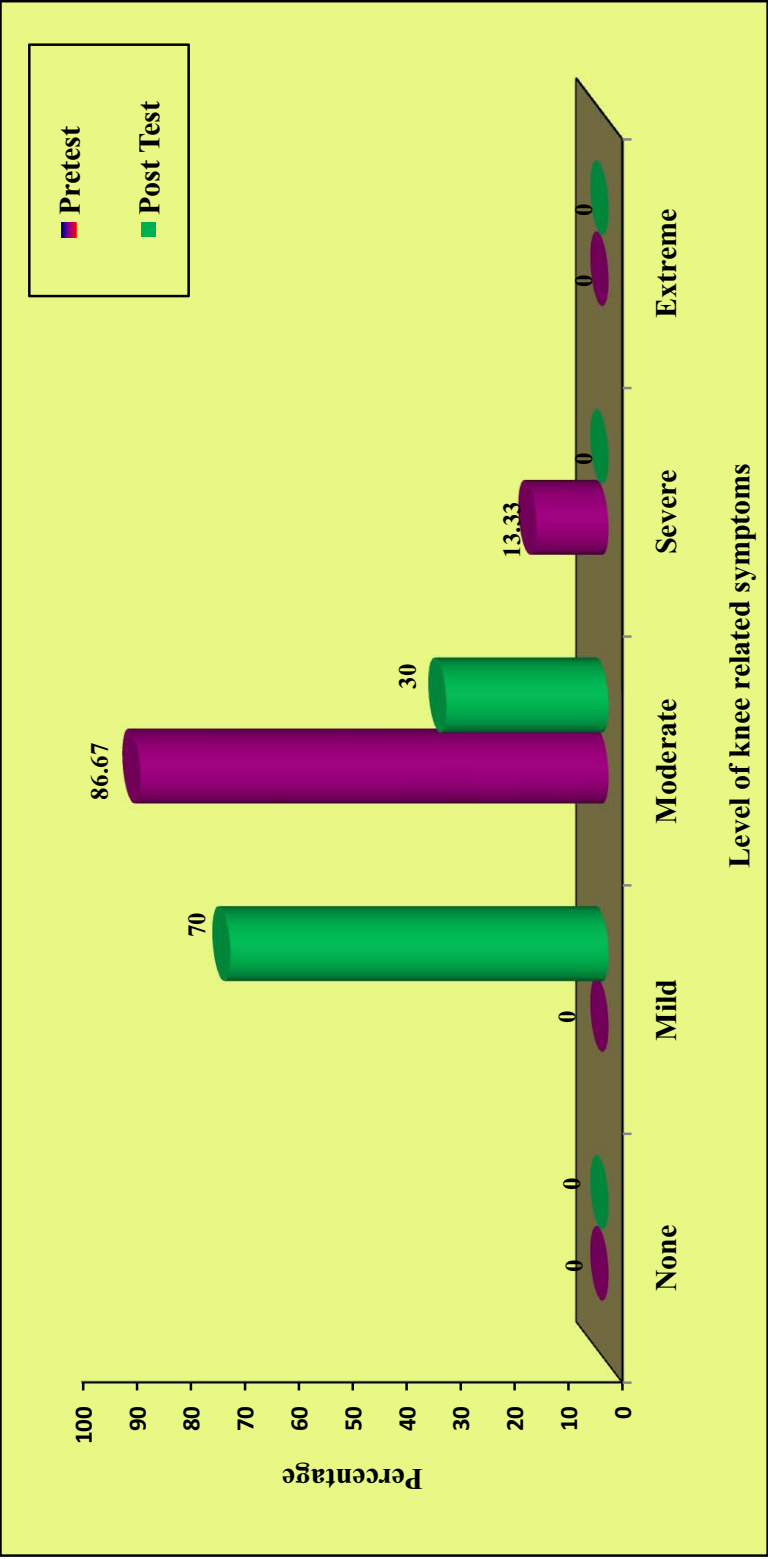


Figure 9: Percentage distribution of pre-test and post-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group-II

SECTION C

Table 4: Comparison of pre-test and post-test mean score of knee related symptoms among patients with knee osteoarthritis in the experimental group-I.

n =30

Experimental group-I	Total score	Mean	S.D	Mean difference	Paired 't' value
Pre-test	60	22.43	4.41	4.20	t= 32.202 p=0.000, S***
Post-test	60	18.23	4.46		

***p<0.001, S – Significant

The table shows that in the experimental group-I, the pre-test mean score of knee related symptoms was 22.43 ± 4.41 and the post-test mean score of knee related symptoms was 18.23 ± 4.46 . The calculated paired 't' value 32.202 was found to be statistically significant at p<0.001 level

Table 5: Comparison of pre-test and post-test mean score of knee related symptoms among patients with knee osteoarthritis in the experimental group-II

n = 30

Experimental group-I	Total score	Mean	S.D	Mean difference	Paired 't' value
Pre-test	60	24.36	3.95	9.06	t= 40.378 p=0.000, S***
Post-test	60	15.30	3.58		

***p<0.001, S – Significant

The table shows that in the experimental group-II, the pre-test mean score of knee related symptoms was 24.36 ± 3.95 and the post-test mean score of knee related symptoms was 15.30 ± 3.58 . The calculated paired 't' value 40.378 was found to be statistically significant at p<0.001 level.

Table 6: Comparison of post-test mean score of knee related symptoms of patients with knee osteoarthritis between the experimental group-I and experimental group-II

N = 60(30+30)

Post Test	Total score	Mean	S.D	Mean difference	Paired 't' value
Experimental group-I	60	18.23	4.46	3.13	t= 2.808 p=0.007,S**
Experimental group-II	60	15.30	3.58		

**p<0.01, S – Significant

The table shows that the post test mean score of knee related symptoms in experimental group-I was 18.23 ± 4.46 and the post-test mean score of knee related symptoms in experimental group-II was 15.30 ± 3.58 . The calculated unpaired 't' value 2.808 was found to be statistically significant at $p < 0.001$ level.

SECTION D

Table 7: Association of pre-test level of knee related symptoms among patients with knee osteoarthritis with their selected demographic variables in the experimental group-I

n = 30

Demographic Variables	Moderate (16 – 30)		Severe (31 – 45)		Chi-Square Value
	No.	%	No.	%	
Age in years					$\chi^2 = 0.000$ d.f = 2 p = 1.000 N.S
41-50	-	-	-	-	
51-60	9	30.0	1	3.3	
61-70	9	30.0	1	3.3	
71-80	9	30.0	1	3.3	
Gender					$\chi^2 = 2.222$ d.f = 1 p = 0.136 N.S
Male	12	40.0	0	0	
Female	15	50.0	3	10.0	
Type of physical activity					$\chi^2 = 0.988$ d.f = 1 p = 0.320 N.S
Sedentary work	10	33.3	2	6.7	
Moderate work	17	56.7	1	3.3	
Heavy work	-	-	-	-	
Body Mass Index					$\chi^2 = 5.000$ d.f = 3 p = 0.172 N.S
Underweight	6	20.0	0	0	
Normal weight	11	36.7	1	3.3	
Overweight	6	20.0	0	0	
Obese	4	13.3	2	6.7	

Demographic Variables	Moderate (16 – 30)		Severe (31 – 45)		Chi-Square Value
	No.	%	No.	%	
Duration of knee osteoarthritis In years					$\chi^2 = 1.717$ d.f = 3 p = 0.633 N.S
<1	4	13.3	0	0	
1 - 3	10	33.3	1	3.3	
4 - 5	9	30.0	2	6.7	
>5	4	13.3	0	0	
Treatment for osteoarthritis					$\chi^2 = 2.917$ d.f = 1 p = 0.088 N.S
Drugs	13	43.3	3	10.0	
Physiotherapy	-	-	-	-	
Both	-	-	-	-	
No treatment	14	46.7	0	0	

*p<0.05, S – Significant, N.S – Not Significant

The table shows that none of the demographic variables had shown statistically significant association with the pre-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group-I

Table 8: Association of pre-test level of knee related symptoms among patients with knee osteoarthritis with their selected demographic variables in the experimental group-II

n = 30

Demographic Variables	Moderate (16 – 30)		Severe (31 – 45)		Chi-Square Value
	No.	%	No.	%	
Age in years					$\chi^2 = 4.038$ d.f = 2 p = 0.133 N.S
41-50	-	-	-	-	
51-60	10	33.3	0	0	
61-70	9	30.0	1	3.3	
71-80	7	23.3	3	10.0	
Gender					$\chi^2 = 1.489$ d.f = 1 p = 0.222 N.S
Male	11	36.7	3	10.0	
Female	15	50.0	1	3.3	
Type of physical activity					$\chi^2 = 6.923$ d.f = 1 p = 0.009 S**
Sedentary work	8	26.7	4	13.3	
Moderate work	18	60.0	0	0	
Heavy work	-	-	-	-	
Body Mass Index					$\chi^2 = 2.162$ d.f = 3 p = 0.539 N.S
Underweight	5	16.7	0	0	
Normal weight	10	33.3	3	10.0	
Overweight	10	33.3	1	3.3	
Obese	1	3.3	0	0	

Demographic Variables	Moderate (16 – 30)		Severe (31 – 45)		Chi-Square Value
	No.	%	No.	%	
Duration of knee osteoarthritis In years					$\chi^2 = 10.769$ d.f = 3 p = 0.013 S**
<1	9	30.0	0	0	
1 - 3	11	36.7	0	0	
4 - 5	5	16.7	4	13.3	
>5	1	3.3	0	0	
Treatment for osteoarthritis					$\chi^2 = 1.994$ d.f = 2 p = 0.369 N.S
Drugs	13	43.3	1	3.3	
Physiotherapy	-	-	-	-	
Both	3	10.0	0	0	
No treatment	10	33.3	3	10.0	

**p<0.01, S – Significant, N.S – Not Significant

The table shows that the demographic variables type of physical activity and duration of knee osteoarthritis had shown statistically significant association with pre-test level of knee related symptoms among patients in the experimental group-II at p<0.01 level and the other demographic variables had not shown statistically significant association with pre-test level of knee related symptoms among patients with knee osteoarthritis in the experimental group-II

CHAPTER V

DISCUSSION

This chapter highlights the discussion of the data analysed based on the objectives of the study. The problem stated is, **''A study to compare the effectiveness of hot application versus contrast therapy on knee related symptoms among patients with knee osteoarthritis in selected community area at Perambalur''**.

The first objective of the study was to assess the level of knee related symptoms among patients with knee osteoarthritis.

In experimental group I, the pre-test level of knee related symptoms revealed that majority 90% had moderate level and 10% had severe level of knee related symptoms and in the post-test majority 70% had moderate level, 13.33% had mild level and 6.67% had severe level of knee related symptoms.

In experimental group II, the pre-test level of knee related symptoms revealed that majority 86.67% had moderate level and 13.33% had severe level of knee related symptoms and in the post-test majority 70% had mild level and 30% had moderate level of knee related symptoms.

The second objective of the study was to assess the effectiveness of hot application on reduction of knee related symptoms among patients with knee osteoarthritis

The calculated pre-test knee related symptoms mean score was 22.43 with standard deviation of 4.41 and the post-test knee related symptoms mean score was 18.23 with standard deviation of 4.46. Calculated 't' value 32.20 was significant at $p < 0.001$.

Based on the findings the stated hypothesis H1: There will be significant difference in knee related symptoms among patients with knee osteoarthritis who receive hot application was accepted.

The third objective of the study was to assess the effectiveness of contrast therapy on reduction of knee related symptoms among patients with knee osteoarthritis.

The calculated pre-test knee related symptoms mean score was 24.36 with standard deviation of 3.95 and the post-test knee related symptoms mean score was 15.30 with standard deviation of 3.58. calculated 't' value 40.37 was significant at $p < 0.001$.

Based on the findings the stated hypothesis H2: There will be significant difference in knee related symptoms among patients with knee osteoarthritis who receive contrast therapy was accepted.

The fourth objective of the study was to compare the effectiveness of hot application versus contrast therapy on reduction of knee related symptoms among patients with knee osteoarthritis.

In experimental group –I the post-test mean score and standard deviation was 15.30 and 3.58. In experimental group II post-test mean score and standard deviation was 18.23 and 4.46. The calculated 't' value was 2.808 indicating that there was a significant difference between post-test level of knee related symptoms in experimental group-I and experimental group-II at $p < 0.001$ level.

Based on the findings the stated hypothesis H3: There will be significant difference between hot application and contrast therapy on reduction of knee related symptoms among patients with knee osteoarthritis was accepted.

The same significant findings was reported by AmalE.Shehata, et al. [2013], in a study to compare the effects of warm, cold, and contrast therapy among 34 patients with knee osteoarthritis at orthopaedic outpatient clinic of Menoufiya University and teaching hospital in Egypt. This study revealed that a distinct individual effect was observed for use of warm, cold and contrast therapy for knee osteoarthritis pain and problems, but the greater knee problem and pain relief were found when subjects used contrast therapy.

The fifth objective was to associate the pre-test level of knee related symptoms among patients who receive hot application with their selected demographic variables.

Findings revealed that there was no significant association between the pre-test level of knee related symptoms and the selected demographic variables of age, gender, type of work, body mass index, duration of knee OA, and treatment for osteoarthritis.

Based on the findings the stated hypothesis H4: There will be significant association between pre-test level of knee related symptoms and selected demographic variables of patients with knee osteoarthritis who receive hot application was not accepted.

The sixth objective was to associate the pre-test level of knee related symptoms among patients who receive contrast therapy with their selected demographic variables.

Findings revealed that the demographic variables type of physical activity and duration of knee OA had shown significant association with the pre-test level of knee related symptoms and the other demographic variables of age, gender, body mass index and treatment for osteoarthritis had not shown statistically significant association with the pre-test level of knee related symptoms.

Based on the findings the stated hypothesis H5: There will be significant association between pre-test level of knee related symptoms and selected demographic variables of patients with knee osteoarthritis who receive contrast therapy was not accepted.

CHAPTER VI

SUMMARY, MAJOR FINDINGS, IMPLICATIONS, RECOMMENDATIONS AND CONCLUSION

This chapter is divided into two sections, in the first section summary of the study findings and conclusion is presented. In the second section implication in various areas of nursing practice, nursing education, nursing administration, nursing research and recommendations for further study are presented.

SUMMARY OF THE STUDY

The objective of the study was to compare the effectiveness of hot application versus contrast therapy on knee related symptoms among patients with knee osteoarthritis between experimental group-I and experimental group-II.

Evaluative with comparative approach and True Experimental pre-test-post-test design was adopted for the study. Independent variable in this study was hot application and dependent variable was contrast therapy. The conceptual framework adopted for the present study was modified wiedenbach's helping art clinical nursing theory. The tool used in this study was modified knee injury and osteoarthritis outcome scale. The main study was conducted in Perambalur and 60 samples were recruited through simple random sampling technique. Hot application and contrast therapy was given as interventions and pre-test and post-test were done on day-1 and day-10 respectively to both groups. The findings revealed that the experimental group-I post test mean score of knee related symptoms 18.23 was greater than the experimental group-II mean score 15.30. The obtained 't' value 2.80 was,

significant at $p < 0.001$ level. Hence it was found that contrast therapy was effective than hot application in reduction of knee related symptoms. There was no significant association found between the pre- test mean score of knee related symptoms of the participants and demographic variables in both the groups.

MAJOR FINDINGS OF THE STUDY

Majority of the participants,

- ❖ 33.33% belong to the age group 51-60 years, 61-70 years and 71-80 years in both experimental group-I and II.
- ❖ 60% in experimental group-I and 53.33% in experimental group-II were females.
- ❖ 60% of both experimental group-I and experimental group-II were doing moderate physical work.
- ❖ 40% in experimental group-I and 43.33% in experimental group-II were normal weight.
- ❖ 36.67% in both groups were having knee osteoarthritis for 1-3 years.
- ❖ 53.33% in experimental group-I and 46.67% in experimental group-II were treated with drug therapy.

Findings related to study intervention

- ❖ In pre-test experimental group-I, 90% had moderate level of knee related symptoms, 10% had severe level of knee related symptoms.
- ❖ In experimental group-II 86.67% had moderate level of knee related symptoms and 13.33% had severe level of knee related symptoms.

- ❖ In post-test in experimental group-I, 70% had moderate level of knee related symptoms,13.33% had mild level of knee related symptoms and 6.6% had severe level of knee related symptoms. In experimental group-II 70% had mild level of knee related symptoms,30% had moderate level of knee related symptoms.
- ❖ In experimental group-I, pre-test knee related symptoms mean score was 22.43 and post-test 18.23.The calculated 't' value 32.202 was significant at $p<0.001$ level.
- ❖ In experimental group-II, pre-test knee related symptoms mean score was 24.36 and post-test 15.30.The calculated 't' value 40.378 was significant at $p<0.001$ level.
- ❖ In post-test knee related symptoms mean score 15.30 in experimental group-II was less than mean score 18.23 of experimental group-I. The calculated 't' value 2.808 was significant at $p<0.001$ level.
- ❖ There was no significant association found between pre-test level of knee related symptoms and the selected demographic variables of experimental group I. The demographic variables type of physical activity and duration of knee osteoarthritis had shown significant association and other demographic variables had not shown significant association with the pre test level of knee related symptoms in the experimental group II.

IMPLICATIONS

The following implications, of vital concern in the field of nursing practice, nursing education, nursing administration and nursing research is derived from the study.

IMPLICATIONS FOR NURSING PRACTICE

The nurse has a vital role in providing safe and effective nursing care to enhance the reduction of knee related symptoms with knee osteoarthritis.

IMPLICATIONS FOR NURSING EDUCATION

1. Educate the students about contrast therapy for osteoarthritis.
2. The effectiveness of contrast therapy on reduction of knee related symptoms is to be published in the nursing journal to make awareness among the nursing students.

IMPLICATIONS FOR NURSING ADMINISTRATION

1. Conduct in-service education programme and continuing nursing education programme for effective management of knee related symptoms among patients with knee osteoarthritis.
2. The nurse advisers can make awareness among staff nurses about significance of contrast therapy for reducing knee related symptoms among patients with osteoarthritis through workshops and seminars.

IMPLICATIONS FOR NURSING RESEARCH

As a nurse researcher, promote more research on to compare the therapy effectiveness of using hot application versus contrast therapy on knee related symptoms among patients with knee osteoarthritis.

RECOMMENDATIONS

The study recommends the following future research,

- ❖ A similar study can be conducted with larger samples for better generalization.
- ❖ The nurse researcher can do the research in various settings with the large samples.
- ❖ A study can be conducted with the effectiveness of other nursing measures such as mud pack therapy, short wave diathermy, and aquatic exercise for reduction of knee related symptoms among patients with knee osteoarthritis.

CONCLUSION

The study compared the effectiveness of hot application and contrast therapy on reduction of knee related symptoms among patients with knee osteoarthritis. From the above findings, it was evidenced that contrast therapy was effective than hot application on relieving knee related symptoms.

REFERENCES

BOOK REFERENCES

1. Brunner and Suddarth's "Text book of Medical surgical nursing" 2014, 13th edition, Wolters kluwer publishers, New Delhi: 1075-1076.
2. B.T. Basavanthappa "Nursing research", 3rd edition, 2007, Jaypee brothers' publishers, Bangalore: 135-137.
3. B.T. Basavanthappa "Medical Surgical nursing", 1st edition, 2003 Jaypee brothers' medical Publishers, New Delhi; 484.
4. Davidson's "Principles and practice of medicine" 21st edition, 2006 ,Churchill Livingstone publishers Newyork:1060-1063
5. Geraldine M.collins-Bridel, "Clinical Guidelines for advanced practice nursing, 2nd edition, 2013, Kavin Sullivan publishers, New Delhi:567-581.
6. Harrison's "Principles of Internal medicine" 16th edition, 2005, MC Graw- Hill Medical publisher, New Delhi: 2036.
7. Ignatavicius workman, "Medical surgical nursing" 7th edition, 2013, Elsevier publishers, New Delhi: 319-320.
8. Joyce. M. Black "Medical surgical nursing" 8th edition, 2012 Elseveir publishers, India: 500.
9. Joyce .K. Keithley "Mastering medical surgical nursing" 1st edition, 1998, Matthew cahill publishers' spring house corporation, Pennsylvania: 546-549

10. Javed .Ansari Farukh Khan, “A text book of Medical Surgical Nursing” 1st edition 2016, pee vee publishers: 2016-2018
11. Kozier and Erb’s “Fundamental of nursing’ 8th edition, 2008, Dorling Kindersley publishers, India: 1022-1037.
12. Lindon, “Introduction to medical surgical nursing” 4th edition, 2007, Elsevier publishers, New Delhi: 893-900.
13. Lewis “Medical surgical nursing” 1st edition, 2011, Elsevier publishers India: 1219-1222
14. Lippincott “Manual of nursing practice” 10th edition, 2014 wolter kluwer publishers, New Delhi: 1043-1054.
15. Luckmann’s “Core principles and practice of medical surgical nursing” 1st edition, 2010, Elsevier publishers: 230
16. Neelam Makhija “Introduction to Nursing Research”, 2006, A.P. Jain publishers, New Delhi: 133.
17. Phipp’s “Medical surgical nursing health and illness” 8th edition, 2007, Mosby Elsevier publishers, New Delhi : 1140-1148.
18. Polit Beck “Essentials of nursing research”, 7th edition, 2010, Wolters Kluwer Publishers, New Delhi, 337-369.
19. Parker, Marilyn E “Nursing Theories & Nursing Practice”, 2nd edition, 2007, Jaypee Brothers publishers,, New Delhi.
20. S.N. Chugh “Text book of Medical surgical nursing” 1st edition, 2013, Avichal publishers, New Delhi: 780-790

JOURNAL REFERENCE

1. Akhihiro sudo., 'Prevalence and risk factors for knee osteoarthritis in elderly Japanese men and women' Journal of orthopedic science (2008) Vol.13, Pg.No.413.
2. Bijlsma JW., 'Strategies for the prevention and management of osteoarthritis of knee' Journal of Clinical Nursing (2007) Vol.11, No.1. Pg.No59 – 76.
3. Bernacki EJ., 'Continuous heat therapy for acute muscular pain' Journal of Occupational Environmental Medicine. (2007) Vol.44, No.12, Pg.No. 1298 – 1306.
4. Brandt KD., 'Heilman DK, Slemenda C, et al. Quadricps strength in women with radiographically progressive osteoarthritis of the knee and those with stable radiographic changes' Journal of Rheumatology 1999; Vol.26, No10, Pg.No.2431-37
5. Cosgray NA., 'Effect of health modalities on Hamstring length' Journal of Orthopedic Sports and Physiotherapy. (2004) Vol;34, No.7, Pg.No.377 – 384.
6. Felson DT., 'Clinical practice Osteoarthritis of the knee' New English journal of medicine (2006) No.354, Pg.No.841-848
7. Fitzgerald GK., 'physical therapy' Journal of American Physiotherapy association, (2011) Published online, Pg.No. 452-69.
8. Jordan JM., 'Prevalence of knee symptoms' journal of Rheumatology. (2007), Vol; 37, No.1. Pg.No.172 – 180.

9. Jezussek D., 'Clinical picture and diagnosis of knee osteoarthritis' Journal of Clinical Nursing, (2007) Vol; 44, No.26, Pg.No.28 – 30.
10. Jorden J., 'Knee pain and knee osteoarthritis severity' Journal of Rheumatology (1997). Vol; 24, No.7, Pg.No.1344 – 1345.
11. Lin YC., 'Test for physical function of the elderly with hip and knee osteoarthritis' Journal of Medical Science (2007), Vol;11, No.5, Pg.No.280 – 286.
12. Lieu CM., 'squatting with prevalence of knee osteoarthritis' Journal of orthopedic nursing. (2007), Vol;28, No.2, Pg.No. 177-179.
13. Lucas B., 'Treatment option for patients with osteoarthritis of knee' British Journal of Nursing,(2005)Vol;14,No.8,Pg.No.976 – 981.
14. Law PP., 'TENS in knee osteoarthritis' Journal of Clinical Nursing. (2004) Vol.10, No.6, Pg.No.295 – 297.
15. Marlene Fransen., 'The epidemiology of osteoarthritis in Asia' International Journal of Rheumatic Diseases (2007), Vol.14, Pg.NO.113-121.
16. Sue. C Delaune., 'Thermotherapy in the management of osteoarthritis' Journal of Clinical Nursing, 2007, Vol.11, No.1, Pg.No.153 – 162.
17. Sutbeyaz., 'Effect of osteoarthritis on exercise ambulatory capacity' Journal of Rheumatology,(2007), Vol.33:,No.9, Pg.No 1835 – 1840.
18. Tsai PF., 'Gender difference in pain experiences' Journal of Gerontologic Nursing, (2007), Vol.28, No.5, Pg.No.8 – 12.

19. Tallon D., 'Symptoms and treatment of preferences of osteoarthritis' Journal of Physical Medicine Rehabilitation. (2003) Vol.25, No.6, Pg.No.408 – 410.
20. Voharano., 'Intervention for osteoarthritis' Journal of Orthopedics, (2002). Pg.No.. 120 – 125.
21. Wang TJ., 'Effect of aquatic exercise programme' Journal of Advance nursing, (2007) Vol.7, No.2, Pg.No.141 – 152.

NET REFERENCE

<http://www.ncbi.nih.gov/pupmed/22972764>
<http://www.ncbi.nih.gov/pupmed/23756344>
<http://www.ncbi.nih.gov/pupmed/19751691>
<http://www.ncbi.nih.gov/pupmed/19639860>
<http://www.ncbi.nih.gov/pupmed/22334264>
<http://www.hindawi.com/journals/jar/2011/374653>
<http://www.ncbi.nlm.nih.gov/pupmed/21551510>
<http://www.painresearchforum.org/papers/7507>
<http://www.ncbi.nlm.nih.gov/pupmed/23313532>
<http://www.ncbi.nlm.nih.gov/pupmed/23973143>
<http://arthritisresearch.com/content/15/5/R106/abstrac>
<http://www.ncbi.nlm.nih.gov/pupmed/23942064>
<http://www.thehindu.com/2007/12/27/stories>
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3302040>
<http://www.sciencedirect.com/science/journal/10634584/21/10>

ANNEXURE - I

LETTER SEEKING PERMISSION FOR RESEARCH PURPOSE

From

Reg. No: 301411704,
II - Year M.sc [Nursing],
Thanthai Roever College of Nursing,
Perambalur.

To

The village President,
Perambalur.

Respected Madam / Sir,

Sub: Requisition for granting permission regarding,

I am doing II- Year M.sc [Nursing] in Thanthai Roever College of Nursing ,Perambalur, under the TamilnaduDr.M.G.R. Medical University Chennai. As a partial fulfillment of my M.sc [Nursing] Degree programme, I am going to conduct a study on ,**“A study to compare the effectiveness of hot application versus contrast therapy on knee related symptoms among patients with knee osteoarthritis in selected community area at perambalur”**. I would like to select your place for my data collection. Hence, I kindly request you to give me permission to conduct the study in your place.

Thanking you

Place:

Yours Sincerely,

Date:

Reg. No: 301411704

ANNEXURE – II

LETTER SEEKING EXPERTS OPINION FOR CONTENT VALIDITY

From

Reg. No: 301411704,
II-Year M.sc [Nursing],
Medical Surgical Nursing Department,
Thanthai Roever College of Nursing,
Perambalur - 621212.

To

Respected Madam/ Sir

Sub: Requisition for content validity of tool regarding,

I am doing II- year M.sc [Nursing] in Thanthai Roever College of Nursing , Perambalur, under the Tamilnadu Dr.M.G.R. Medical University Chennai. As a partial fulfillment of my M.sc[Nursing] Degree programme, I am conducting a research on. **“A study to compare the effectiveness of hot application versus contrast therapy on knee related symptoms among patients with knee osteoarthritis in selected community area at Perambalur”**. A tool has been developed for the research study. I am sending the above stated for your expert and valuable opinion. I will be thankful for your kind consideration. Kindly return it to the Undersigned.

Thanking you

Place:

Yours Sincerely,

Date:

Reg. No: 301411704

ANNEXURE - III

EVALUATION CRITERIA CHECK LIST FOR VALDATION

INTRODUCTION

The expert is requested to go through the following criteria for evaluation. Three columns are given for responses and a column for remarks. Kindly place tick mark in the appropriate column and give remarks.

Interpretation of column:

- Column I : Meets the criteria
Column II : Partially meet the criteria
Column III : Does not meet the criteria

S.NO	Criteria	1	2	3	Remarks
1.	Scoring Adequacy Clarity Simplicity				
2.	Content Logical sequence Adequacy Relevance				
3.	Language Appropriate Clarity Simplicity				
4.	Practicability It is easy to score Does it precisely Utility				

Signature : Any Other Suggestion
Name :
Designation :
Address :

ANNEXURE - IV

LIST OF EXPERTS OPINION FOR CONTENT VALIDITY OF RESEARCH TOOL

1. Prof.R.Punithavathi. M.Sc.(N)
Principal,
Thanthai Roever College of Nursing,
Perambalur.
2. Prof.V.J.Elizabeth.M.Sc.(N)
Vice principal,
Thanthai Roever College of Nursing,
Perambalur.
3. Dr.Rajina Rani M.Sc.(N), Phd
Principal,
RAASU Academy college of nursing
Poovanthi
4. Prof.M.Shanthi M.Sc (N)
Professor,
Dr.G.Sagunthala college of Nursing
Trichy.
5. Prof.K.S Pushpalatha M.Sc(N)
Professor,
Shanmuga college of nursing,
Salem.

ANNEXURE – V (A)

CERTIFICATE OF ENGLISH EDITING

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Reg. No: 301411704, II- Year M.Sc. [Nursing] Student of Thanthai Roever College of Nursing has done a dissertation study on **“A study to compare the effectiveness of hot application versus contrast therapy on knee related symptoms among patients with knee osteoarthritis in selected community area at Perambalur”**. This study was edited for English language appropriateness.

Signature

ANNEXURE – V(B)

CERTIFICATE OF TAMIL EDITING

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Reg. No: 301411704, II- Year M.Sc. [Nursing]
Student of Thanthai Roever College of Nursing has done a dissertation study
on **“A study to compare the effectiveness of hot application versus
contrast therapy on knee related symptoms among patients with knee
osteoarthritis in selected community area at Perambalur”**. This study was
edited for Tamil language appropriateness.

Signature

ANNEXURE - VI

ஒப்புதல் படிவம்

பெரம்பலூர் தந்தை ரோவர் செவிலியர் கல்லூரியில் முதுகலை செவிலிய பட்டபடிப்பு பயிலும் கோ.ராஜபிரியா அவர்களால் நடத்தப்படுகின்ற வெப்ப மற்றும் குளிர் ஒத்தடம் மூலம் மூட்டு வலி குறைத்தல் சம்பந்தமான ஆராய்ச்சி நோக்கத்தினை பற்றியும், சிகிச்சை பற்றிய விளக்கமும் எனக்கு தெளிவாக தெரிவிக்கப்பட்டது. இதில் வெப்பம் மற்றும் குளிர் ஒத்தடம் எனது மூட்டின் மேல் கொடுப்பதற்கு நான் சம்மதிக்கிறேன். இதில் பங்கேற்பதற்கு எனக்கு எந்த ஆட்சேபனையும் இல்லை. மேலும் இந்த விவரங்களை வெளியிடுவதற்கும் அச்சிடுவதற்கும் முழு சம்மதம் அளிக்கிறேன்.

கையெழுத்து

பெயர்:

தேதி:

இடம்:

ANNEXURE – VII (A)
DATA COLLECTION TOOL
SECTION-A DEMOGRAPHIC DATA

Sample no:

Kindly furnish the following details by placing a tick () mark in appropriate choice

1] AGE IN YEARS

- | | |
|----------|--------------------------|
| a] 41-50 | <input type="checkbox"/> |
| b] 51-60 | <input type="checkbox"/> |
| c] 61-70 | <input type="checkbox"/> |
| d] 71-80 | <input type="checkbox"/> |

2] GENDER

- | | |
|-----------|--------------------------|
| a] Male | <input type="checkbox"/> |
| b] Female | <input type="checkbox"/> |

3] TYPE OF WORK

- | | |
|-------------------|--------------------------|
| a] Sedentary work | <input type="checkbox"/> |
| b] Moderate work | <input type="checkbox"/> |
| c] Heavy work | <input type="checkbox"/> |

4] BODY MASS INDEX

- | | |
|------------------|--------------------------|
| a] Under weight | <input type="checkbox"/> |
| b] Normal weight | <input type="checkbox"/> |
| c] Over weight | <input type="checkbox"/> |

5] DURATION OF KNEE OA IN YEARS

a] <1

☐

b] 1-3

☐

c] 4-5

☐

d] >5

☐

6] TREATMENT FOR OSTEOARTHRITIS

a] Drugs

☐

b] Physiotherapy

☐

c] Both

☐

d] No Treatment

☐

SECTION-B

MODIFIED KNEE INJURY AND OSTEOARTHRITIS

OUTCOME SCORE

Kindly tick (✓) the appropriate answer

SYMPTOMS	Score 0	Score 1	Score 2	Score 3	Score 4
How severe is your knee stiffness after first wakening in the morning?	None	Mild	Moderate	Severe	Extreme
How severe is your knee stiffness after sitting, lying, or resting later in the day?	None	Mild	Moderate	Severe	Extreme
Do you have swelling in your knee?	Never	Rarely	Sometimes	Often	Always
Do you feel grinding, hear clicking or any other type of noise when your knee moves?	Never	Rarely	Sometimes	Often	Always
Does your knee catch or hang up when moving?	Never	Rarely	Sometimes	Often	Always
Can you straighten your knee fully?	Always	Often	Sometimes	Rarely	Never
Can you bend your knee fully?	Always	Often	Sometimes	Rarely	Never

What degree of pain have you experienced the last week when...?					
PAIN	Score 0	Score 1	Score 2	Score 3	Score 4
Twisting/pivoting on your knee	None	Mild	Moderate	Severe	Extreme
Straightening knee fully	None	Mild	Moderate	Severe	Extreme
Bending knee fully	None	Mild	Moderate	Severe	Extreme
Walking on flat surface	None	Mild	Moderate	Severe	Extreme
Going up or down stairs	None	Mild	Moderate	Severe	Extreme
At night while in bed	None	Mild	Moderate	Severe	Extreme
Sitting or lying	None	Mild	Moderate	Severe	Extreme
Standing upright	None	Mild	Moderate	Severe	Extreme

Total Score :

- 0-15 - Mild level of knee related symptoms
- 16-30 - Moderate level of knee related symptoms
- 31-45 - Severe level of knee related symptoms
- 46-60 - Extreme level of knee related symptoms

ANNEXURE – VII (B)

தகவல் சேகரிப்பு படிவம்

பகுதி - அ

சொந்தக் குறிப்பு:

கீழே கேட்கப்பட்ட விபரங்களை படித்து சரியான இடத்தில் குறியிடவும்



1 வயது (வருடங்களில்)

அ. 41-50

☐

ஆ. 51-60

☐

இ. 61-70

☐

ஈ. 71-80

☐

2 பாலினம்

அ.ஆண்

☐

ஆ.பெண்

☐

3 உடல் உழைப்பின் வகை

அ.இலகுவான வேலை

☐

ஆ.மிதமான வேலை

☐

இ.கடினமான வேலை

☐

4 உடல் நிறை குறியீட்டெண்

அ.குறைவான எடை

☐

ஆ.சரியான எடை

☐

இ.அதிக எடை

☐

5 மூட்டு வலியின் காலஅளவு வருடங்களில்

அ. < 1

☐

ஆ. 1-3

☐

இ. 4-5

☐

ஈ. > 5

☐

6 மூட்டு வலிக்கு எந்தவிதமான சிகிச்சை எடுத்துக்
கொண்டீர்கள்?

அ.மாத்திரை

☐

ஆ.இயன்முறை சிகிச்சை

☐

இ.இரண்டும்

☐

ஈ.எதுவும் இல்லை

☐

பகுதி - ஆ

வடிவமைக்கப்பட்ட வினாத்தாள்

கீழே கொடுக்கப்பட்ட கேள்விகளுக்கு சரியான விடையை (✓)
குறிக்கவும்

நோய் அறிகுறிகள்	மதிப்பெண் 0	மதிப்பெண் 1	மதிப்பெண் 2	மதிப்பெண் 3	மதிப்பெண் 4
காலையில் நீங்கள் முதல் தடவையாக படுக்கையில் இருந்து எழும்போது உங்கள் முழங்கால் இணைப்புகளின் விறைப்புத் தன்மை எவ்வளவு கடினமாக இருந்தது	எதுவும் இல்லை	சிறிதளவு மென்மையாக இருந்தது	மிதமானதாக இருந்தது	கடுமையாக இருந்தது	மிகவும் கடுமையாக இருந்தது
பகலின் பிற்பகுதியில் (மாலை நேரங்களில்) உட்கார்ந்தபோதும் படுத்துக்கொண்டு இருந்தபோதும் ஓய்வு எடுத்துக்கொண்டிருந்தபோதும் விறைப்பு எப்படி இருந்தது?	எதுவும் இல்லை	சிறிதளவு மென்மையாக இருந்தது	மிதமானதாக இருந்தது	கடுமையாக இருந்தது	மிகவும் கடுமையாக இருந்தது
உங்கள் முழங்கால் மூட்டில் வீக்கம் இருந்ததா?	எப்போதும் இல்லை	எப்போதோ ஒருதடவை இருந்தது	சில நேரங்களில் இருந்தது	அடிக்கடி இருந்தது	எல்லா நேரங்களிலும் இருந்தது
உங்கள் முழங்கால் அசைக்கப்பட்ட பொழுது உராய்வுசத்தம் அல்லது கிளிக்கிளிக் சத்தம் அல்லது வேறு ஏதாவது சத்தம் கேட்டதா?	எப்போதும் இல்லை	எப்போதோ ஒருதடவை இருந்தது	சில நேரங்களில் இருந்தது	அடிக்கடி இருந்தது	எல்லா நேரங்களிலும் இருந்தது
நடக்கும் பொழுது உங்கள் முழங்கால்மூட்டு பிடித்துக்கொண்டதா?	எப்போதும் இல்லை	எப்போதோ ஒருதடவை இருந்தது	சில நேரங்களில் இருந்தது	அடிக்கடி இருந்தது	எல்லா நேரங்களிலும் இருந்தது
உங்கள் முழங்காலை முழுதுமாக நீட்ட முடிந்ததா?	எல்லா நேரங்களிலும் முடிந்தது	அடிக்கடி முடிந்தது	சில நேரங்களில் முடிந்தது	எப்போதாவது ஒருமுறை மட்டும்	எப்போதும் முடியவில்லை
உங்கள் முழங்காலை முழுதுமாக வளைக்க முடிந்ததா?	எல்லா நேரங்களிலும் முடிந்தது	அடிக்கடி முடிந்தது	சில நேரங்களில் முடிந்தது	எப்போதாவது ஒருமுறை மட்டும்	எப்போதும் முடியவில்லை

கடந்தவாரம் அடியில் குறிப்பிடப்பட்டுள்ள வேலைகளைச் செய்தபோது உங்கள் முழங்கால்மூட்டுவலி எந்த அளவிற்கு இருந்ததை உணர்ந்தீர்கள்?					
முழங்கால் மூட்டு வலி	மதிப்பெண் 0	மதிப்பெண் 1	மதிப்பெண் 2	மதிப்பெண் 3	மதிப்பெண் 4
உங்கள் முழங்காலைத் திருப்பிய போதும் சுழற்றியபோதும்.	வலி இல்லை	சிறிதளவு வலி இருந்தது	மிதமான வலி இருந்தது	அதிகமான வலி இருந்தது	கடுமையான வலி இருந்தது
முழங்காலை முழுமையாய் நேராக நீட்டியபோது எப்படி இருந்தது?	வலி இல்லை	சிறிதளவு வலி இருந்தது	மிதமான வலி இருந்தது	அதிகமான வலி இருந்தது	கடுமையான வலி இருந்தது
முழங்காலை முழுவதுமாக வளைத்தபொழுது	வலி இல்லை	சிறிதளவு வலி இருந்தது	மிதமான வலி இருந்தது	அதிகமான வலி இருந்தது	கடுமையான வலி இருந்தது
சமதளத்தில் நடந்தபோது	வலி இல்லை	சிறிதளவு வலி இருந்தது	மிதமான வலி இருந்தது	அதிகமான வலி இருந்தது	கடுமையான வலி இருந்தது
மாடிப்படிகளை ஏறும்போது அல்லது இறங்கும்போது	வலி இல்லை	சிறிதளவு வலி இருந்தது	மிதமான வலி இருந்தது	அதிகமான வலி இருந்தது	கடுமையான வலி இருந்தது
இரவுநேரத்தில் படுக்கையில் படுத்துக்கொண்டு இருக்கும்போது	வலி இல்லை	சிறிதளவு வலி இருந்தது	மிதமான வலி இருந்தது	அதிகமான வலி இருந்தது	கடுமையான வலி இருந்தது
உட்கார்ந்துகொண்டு அல்லது காலைபரப்பிக் கொண்டு உள்ளபொழுது	வலி இல்லை	சிறிதளவு வலி இருந்தது	மிதமான வலி இருந்தது	அதிகமான வலி இருந்தது	கடுமையான வலி இருந்தது
எழுந்து நிற்கும்பொழுது	வலி இல்லை	சிறிதளவு வலி இருந்தது	மிதமான வலி இருந்தது	அதிகமான வலி இருந்தது	கடுமையான வலி இருந்தது

மொத்த மதிப்பெண்

- 0-15 - லேசான முழங்கால் தொடர்பான அறிகுறிகள்
- 16-30 - மிதமான முழங்கால் தொடர்பான அறிகுறிகள்
- 31-45 - கடுமையான முழங்கால் தொடர்பான அறிகுறிகள்
- 46-60 - தீவிர முழங்கால் தொடர்பான அறிகுறிகள்